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ABSTRACT

This paper describes the principles followed by the Educational Testing Service (New Jersey) in adapting, for students with various disabilities, the Scholastic Assessment Test I (SAT I), the commonly used test for college admissions that assesses verbal and mathematical reasoning. The paper notes that developers of standard tests should be informed early in the test construction process that the test will likely be adapted for use with students having disabilities. Examples are offered of ways that questions in both the math and verbal sections can be originally presented that make them easier to adapt later. Specific guidelines are offered for developing the SAT I in five formats: (1) cassette, (2) script, (3) braille, (4) regular type, and (5) large type. The paper stresses that the development of special versions of the SAT I for students with disabilities involves considerable attention to detail, an understanding of the populations being served, and ample time for preparing and fine-tuning the adapted materials. Appendices include a list of symbols and indicators in the Nemeth Code, and some examples of adaptations for both the verbal and mathematics sections. (DB)

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SAT I Test Development Procedures For Students With Disabilities

by

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Educational Testing Service

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The College Board and Educational Testing Service have traditionally given students with disabilities the opportunity to take tests like the SAT by providing special accommodations. The accommodations provided vary with the disability. Some students only need extra time; others need special editions of the test such as large type, cassette versions, or braille versions.[1] It is the preparation of these special editions that we will focus on today.

SAT I is a test for college admissions that assesses verbal and mathematical reasoning. Scores are reported on a 200-800 scale. Because it is important to have a reasonable statistical basis for the scores provided to students taking the test in a special format, tests adapted for use in the nonstandard program are ones that have been administered to the SAT population as a whole and for which detailed statistical information has been obtained. Although the way questions are presented to students with disabilities may vary slightly from the way they are presented in standard administrations, it is assumed that the tests in the standard and nonstandard administrations are the same and the scores have almost the same meaning.

Early Identification of Tests To Be Adapted

Whenever possible, the test assembler (the person responsible for developing the test for use in the standard administration) should know that the test he or she is about to assemble is going to be adapted for use in the program for students with disabilities. Even though test assemblers have to meet strict content and statistical specifications, they can often choose the most appropriate question from among several others that would satisfy a particular specification. For example, either the question in Figure 1 or the question in Figure 2 would satisfy a 3-dimensional geometry specification, but the Figure 2 question would be more suitable for those taking a braille version of the SAT I. The perspective obvious in Figure 1 to a sighted student would not be apparent to a blind student who must depend on the feel of a raised-line drawing.

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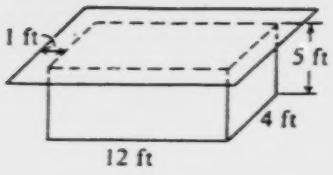
[1]Whether students are tested at a special administration in their own high schools or at a national administration with extended testing time, their score reports will include the notation "Nonstandard Administration."



The figure above shows a rectangular piece of tin laid on a rectangular box. If the tin extends uniformly 1 foot over each edge as shown, what is the area, in square feet, of the top surface of the tin?

(A) 65
(B) 70
(C) 78
(D) 84
(E) 98

Figure 1

If n faces of a cube are painted, the area of the unpainted faces is what fraction of the total surface area of the cube?

(A) $\frac{n}{6}$ (B) $\frac{n}{8}$ (C) $\frac{n-6}{6}$

(D) $\frac{6-n}{6}$ (E) $\frac{6-n}{8}$

Figure 2

Some Considerations in Developing the Math Tests

There are several steps that the math test assembler can take to make it easier to adapt the test later. For example, figures for test questions that would ordinarily be presented without labels are often easier to describe on the cassette version of the test if the figure is labeled. It is useful to include some of that labeling at the test-assembly stage so that there are fewer changes in items between the standard and nonstandard administrations. Remember, we want the scores on the standard and nonstandard administrations to be as comparable as possible, and one procedure that helps meet that goal is to limit the number of changes made in test questions between the two administrations.

The test assembler should label figures carefully. For example, avoid using

pairs of letters that sound alike such as B and E, B and D, or M and N because they will be difficult to distinguish on the cassette.

letters that look alike such as O and Q because they may be difficult to distinguish for visually impaired students.

letters such as small p and q or d and b because they may be difficult for dyslexic students.

The test assembler should avoid using cluttered figures. It is important to keep in mind that the representation of characters in braille requires more space than corresponding regular characters. For example, it takes considerable space to braille all the symbols necessary to indicate $x°$. If several angles meeting at a point are to be identified, it is impossible to fit in the braille numbers and/or letters. In such a situation, the brailler would have to put the numbers or letters outside the figure with a line drawn to the appropriate place on the figure. As a result, the figure could be more confusing for the blind student than the same figure would be for the sighted student.

The test assembler also needs to check to see what symbols are available in the Nemeth Code. Students are sent a copy of a "Guide to the Nemeth Code" and may use the guide while taking the test.) Therefore, special symbols (or newly defined symbols) used in math tests should be limited to symbols that are available in the Nemeth Code. (See Appendix for a list of symbols available in the Nemeth Code.)

Some Considerations in Developing the Verbal Tests

Sentence completion questions are read in the script and cassette versions six times, once with no answer filled in and then once with each of the five different answer choices. Thus, choosing a sentence that is only a few words shorter than an alternative can make a difference. (See Appendix B for an example.)

For the reading selections, it is undesirable to have long paragraphs since in certain questions students are referred to a particular paragraph. We sometimes make extra paragraph breaks in the reading passages just to make paragraphs of a manageable size. Once again, it is desirable to make these changes at the test assembly stage.

Test Formats

The test adapter is responsible for developing the SAT I for students with disabilities in five formats:

- Cassette
- Script
- Braille
- Regular Type
- Large Type

Students often use more than one format when they take the test. For example, the cassette version of the test may be used along with the braille or large type or regular type version depending on the student's disability. Some students who use the cassette version of the test may be learning disabled and use the cassette to help them as they use the regular-type version; other students have a visual impairment that makes the cassette useful as they work their way through the large-type version; still others use the cassette as an accompaniment to the braille version. Therefore, every version of the test must be consistent with every other version. They need not match word for word, but they must be consistent. Insuring such consistency requires considerable attention to detail. Attention must be paid not only to the questions, but to directions for taking the test and responding to the questions. Not all students, for example, will be using the standard answer sheet.

Cassette and Script Versions

There tend to be more issues that have to be dealt with in creating the cassette version of the test than there are in creating other versions of the test, so the script version is prepared first. Trained readers are employed to record the script and the recorded version is checked for accuracy. Once the recorded version is completed, the corresponding script is prepared for publication. The published script is used by those who prefer to have, or need to have, the test read to them. The following issues are dealt with in preparing the cassette.

The script is precise and detailed. Possible ambiguities are handled before the recording session. For example, the question

If $(y + 2)^2 = (y - 2)^2$, what is the value of y?

(A) 0 (B) 1 (C) 2 (D) 4 (E) 6

would be written for the script as

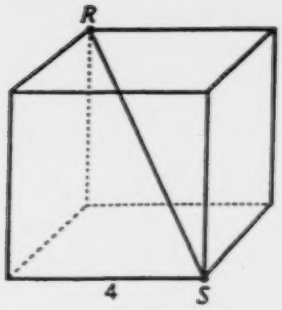
> If parenthesis y plus 2 closed parenthesis squared equals parenthesis y minus 2 closed parenthesis squared, what is the value of y?
>
> The choices are (A) zero, (B) 1, (C) 2, (D) 4, (E) 6.

This helps ensure an efficient recording session and also ensures that those who have the published script read to them will receive accurate and unambiguous information and that they will all receive the same information.

Tone-indexing is used on the cassette to help students work their way through the cassettes. Tone-indexing is a low, almost inaudible tone when the cassette is played at normal speed. However, in fast forward or fast reverse, tone indexes are high-pitched beeps. A different tone is used to signal new directions, to signal each new question, each reading passage, and each paragraph in the reading passages. The students can use tone-indexing, for example, to go back to the beginning of a question by playing fast reverse and listening for the beep. We require, therefore, that the tape recorder used to administer the test both fast forwards and fast reverses in the "play" mode.

For those math questions that refer to geometric figures, charts or graphs, students are expected to refer to some representation of the figure. Many students refer to the drawings in the large or regular type booklets and some students refer to the booklet of supplementary figures which contains raised line drawings of the relevant figures. (Labels and numbers on these figures are in braille. If the student does not read braille, the supervisor is instructed to read the relevant information to the student.) The purpose of the explanations is to help guide the student through the drawing. For example, a blind student could have a great deal of trouble recognizing what a raised line drawing of a cube (see Figure 3) is supposed to be. Therefore, at the minimum, the fact that the drawing is a cube would be mentioned on the tape. Usually, additional information is given. As mentioned earlier, it is generally a good idea to avoid 3-dimensional figures.

It should be noted that we do not make the explanations so complete that it becomes unnecessary to refer to the drawings. There are a variety of reasons for this. If we explained every detail of the drawing, the explanations could well go on for several pages of script. This adds to the time it takes to listen to the cassette, the fatigue of the student, and quite frankly the boredom of the testing situation. Finally, since many students who use the cassette are not blind, it was decided not to attempt completely self-contained descriptions of figures.



In the cube above, what is

the length of *RS*?

Figure 3

Many of the questions based on reading passages refer to a particular section of the passage. In the regular and large type versions, lines of passages are numbered and some questions refer to specific lines in the passage. The way we do this in the cassette and braille versions is to number each paragraph and refer the students to the appropriate paragraph. Because of the tone-indexing, students are able to locate appropriate paragraphs fairly quickly using fast forward or fast reverse.

In the regular version of the SAT I, footnotes are sometimes provided at the end of a passage for definition. In the braille, cassette, and script versions of reading passages, we do not use footnotes but instead incorporate the information into the text.

The sentence completion questions in both the cassette and script versions are presented quite differently from the way they are presented in the other versions of the test. In the braille, large type and regular type versions, the student is presented with a sentence from which one or two words have been omitted. This sentence is followed by five choices, one of which contains the word or words that make a logical sentence. For the cassette and script versions, the sentence is first read to the students and the word "blank" is used to indicate the blank space. Then for each of the answers choices, the word corresponding to the choice is read and then the entire sentence is reread with the word(s) inserted in the sentence (see Appendix B).

Braille Version

Although the braille version of the test is developed after the cassette has been completed, work on the braille version of the test progresses concurrently. This is partly because both versions of the test use the same raised line drawings. Experienced braillists, such as those at Associated Services for the Blind in Philadelphia, can often identify problems in test questions, and more importantly, solve them. Early discussions with the braillists means that changes affecting the braille version can be incorporated into the cassette version before the actual recording is done.

In the reading portions of the braille version, lines are not numbered but, like in the cassette version, paragraphs are. Questions based on a particular part of the passage refer students to a particular paragraph, not a particular line. On both the braille and cassette versions, footnotes are incorporated into the text instead of being presented at the end of the passage.

Sentence completion questions are presented in the original format; that is, the sentences are not repeated.

Regular Type and Large Type

There is little to say about developing these versions of the test except that they are very much like the original test. Paragraphs in the reading portion of the test are numbered so that a student taking a combination of the script version of the test and the regular version of the test is given the same information. As is the case for national administrations, line references are used for these versions. This is done because line references are, quite frankly, more efficient for the student than paragraph numbers and because many of the students taking the regular or large type versions take the test without using any other version of the test.

The large type version is usually printed in 18 point and the regular type version in 10 point. The large type version has about four times as many pages as does the regular type version.

Summary

Developing special versions of the SAT I for students with disabilities is a complex process that requires considerable attention to detail and an understanding of the populations being served. Ample time is allocated for preparing and fine-tuning materials and for consulting with appropriate specialists such as those familiar with the needs of blind students. Test developers who are embarking on such an activity for the first time are strongly urged to seek advice from those who have had prior experience. We have found that the more we know, the more we worry. However, we have found the development of braille, cassette, and other nonstandard versions of tests to be a challenging and rewarding experience.

Appendix A

Symbols and Indicators that are Available in "Guide to Nemeth Code"

Symbols

Arabic numerals 0. 1. 2. 3. 4. 5. 6. 7. 8. 9

Roman numbers I V X

\+

\−

· (multiplication dot)

×

÷

±

=

≠

<

≦

>

∥

∦

⊥

∠

△

□

▭

⊙

⊙

▱

(

)

″ (ditto)

′ (prime)

/ (slash, e.g., miles hour; negation

)‾‾‾ (divide)

↑

↓

→

←

⟷

*

○ (open circle)

☆

▽

⊕

⊖

⊗

†

‡

∪ (union)

∩ (intersection)

˅ (or)

˄ (and)

| (such that)

~ (not)

∈ (is an element of)

∉ (is not an element of)

⊂ (is a subset of)

⊃ (contains)

Symbols continued

(	°	(degree)
)	%	
{	&	
}	¢	
[	$	
]	#	
[	∝	
]	| |	(absolute value)
<	√	
>	.	(decimal point)
	,	(comma in #)
	—	(dash)
	:	(ratio)
	|	(tally mark)
	!	(factorial)

Sentence Completion

Directions: Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath the sentence are five words or set of words labeled A through E. Choose the word or set of words that, when inserted in the sentence, best fits the meaning of the sentence as a whole.

Regular & Large Type Version

Example:

Medieval kingdoms did not become constitutional republics overnight; on the contrary, the change was—.

(A) unpopular
(B) unexpected
(C) advantageous
(D) sufficient
(E) gradual

The correct answer is choice (E).

Cassette & Script Version

For Example

Medieval kingdoms did not become constitutional republics overnight semi-colon on the contrary comma the change was blank,

The options are

(A) unpopular
Medieval kingdoms did not become constitutional republics overnight semi-colon on the contrary comma the change was unpopular.

(B) unexpected
Medieval kingdoms did not become constitutional republics overnight semi-colon on the contrary comma the change was unexpected.

(C) advantageous
Medieval kingdoms did not become constitutional republics overnight semi-colon on the contrary comma the change was advantageous

(D) sufficient
Medieval kingdoms did not become constitutional republics overnight semi-colon on the contrary comma the change was sufficient.

(E) gradual
Medieval kingdoms did not become constitutional republics overnight semi-colon on the contrary comma the change was gradual.

The correct answer is (E), "gradual": Medieval kingdoms did not become constitutional republics overnight; on the contrary, the change was gradual.

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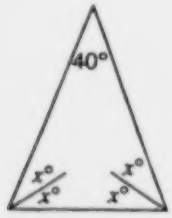
Regular & Large Type Version



(Figure and text would be enlarged for the large-type version.)

18. In the triangle above, what is the value of x?

Braille Version

(Figure would be a raised line drawing on the facing page. Symbols and text are in braille.)

18. In the triangle on the facing page, what is the value of x?

Cassette Version

Question 18. Refer to the supplementary figure for question 18, section 4.

The figure presents a triangle with one angle marked 40 degrees. Each of the remaining angles is divided into 2 parts, each of which is marked x degrees.

In the triangle, what is the value of x?